Revisiting Student - College Matching Problem

This project is about implementation and augmentation of Nobel prize winning work done by Lloyd Shapley and Alvin Roth on the famous “Stable Marriage Problem”.

Abstract :

The problem of matching mates is one of the oldest problems in history of mankind.

Fifty five years ago , Lloyd Shapley became the godfather of modern matchmaking when he wrote a paper in which he sought to answer the question of how individuals in a group of people could be paired up when all had different views on who might be their best partner.

His work was later developed by Alvin Roth, who found other practical uses for the approach , most famous of which is problem of allocating students to schools/colleges and making sure that they are allocated best possible choice based on their grades/interview performances.

What do we want to do and why is it different ?

We wish to apply this procedure for college admissions in India. It is possible to formulate this as a stable marriage problem exactly like how Roth formulated in case of New York public schools . But the challenges in this case are different. For Gale-Shapley algorithm to work for a stable marriage problem in which there are m students playing men and n colleges playing women , every student must include all n choices in his/her preference list and every college must include every student is its preference list. The difficulty with this constraint , specially in India is that there are too many colleges. If we consider engineering college admissions, in Maharashtra state alone , there are 700+ engineering colleges so assuming each college has 5 branches , for every student there are 700\*5 = 3500 possible choices to put on his/her list which is impossible to do manually. We are trying to find a solution of this problem. Currently the process of allocating students to engineering colleges takes place through CAP(Common admission process). Usually there are 3-4 cap rounds and it can be easily shown that rogue couples exist in marriage formed by this process. Also , this process consumes about a month or more and demands huge manpower and time. We are trying to reduce total CAP rounds in the process and by doing that also making it faster and cheaper.

Make the machine generate the Lists :

When a student makes a preference list of colleges , choices on that list are influenced by number of factors like

1. Placement of college
2. Quality of education
3. Branch
4. Fee structure of college
5. Distance of college from hometown of student
6. Cost of living at the location of college
7. Infrastructure and funding available to college
8. If college if government or private
9. Internet/Public opinion and reputation of college

etc.

The idea behind this project is to somehow reflect the preferences of students about above mentioned factors in a form understandable by a machine(a computer) and once machine understand what kind of colleges student like , making the machine generate the preference list for students according to his choices of various parameters. Because a computer has enormous computing power available to it , it can generate the preference list that contains all available choices , may them be 50 , 500 or 5000.

For this we have developed a mechanism which we have named a “Fuzzy Control System”. The way this system works is it takes relative importance of various parameters as input from student and outputs numerical weight reflecting importance of that factors so that computer can use them along with the statistical information about colleges to generate the preference lists for students.

Along with above mentioned mechanism we are also implementing machine learning solutions that could be used to improve the process and help machine learn how to make a preference list based on a student’s likings of parameters.